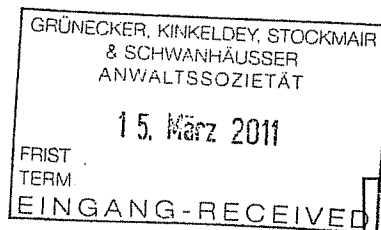




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|      |          |
|------|----------|
| Date | 15.03.11 |
|------|----------|

|   |  |
|---|--|
| Reference<br>EP50308UW900kja                                      | Application No./Patent No.<br>05783151.3 - 1226 / 1803172 PCT/JP2005017076 |
| Applicant/Proprietor<br>SEMICONDUCTOR ENERGY LABORATORY CO., LTD. |  |

### Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the supplementary European search report (Art. 153(7) EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☒ 1 additional set(s) of copies of such documents is (are) enclosed as well.

### Refund of the search fee

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.





**SUPPLEMENTARY  
EUROPEAN SEARCH REPORT**

Application Number  
EP 05 78 3151

| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |  |   |
|---|---|--|---|
| Category  | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim                                | CLASSIFICATION OF THE APPLICATION (IPC) |
| ① X ✓   | EP 1 418 567 A1 (THOMSON LICENSING INC [FR]) 12 May 2004 (2004-05-12)         | 1,6,12, 13,15                                    | INV.<br>H01L51/50                       |
| Y   | * claim 1; figure 6 *   | 2,7  |   |
| ② Y ✓   | EP 1 339 112 A2 (EASTMAN KODAK CO [US]) 27 August 2003 (2003-08-27)           | 2,7  |   |
|   | * page 19, paragraph 106; example 5 *   |  |   |
|   |   |  | TECHNICAL FIELDS SEARCHED (IPC)         |
|   |   |  | H01L                                    |
| The supplementary search report has been based on the last set of claims valid and available at the start of the search.  |   |  |   |
| Place of search<br>The Hague  |   | Date of completion of the search<br>4 March 2011 | Examiner<br>Parashkov, Radoslav         |
| CATEGORY OF CITED DOCUMENTS   |   |  |   |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |   |  |   |



Application Number

EP 05 78 3151

### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☒ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 6, 7, 15(completely); 12, 13(partially)

a light emitting device comprising: a first electrode, a laminated body including a layer containing a light emitting substance in contact with the first electrode, a layer having an acceptor level, in contact with the laminated body, a layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

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2. claims: 3, 8, 9, 16(completely); 5, 12, 13(partially)

a light emitting device comprising: a first electrode, a first layer having a donor level in contact with the first electrode, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

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3. claims: 4, 10, 11, 14, 17(completely); 5, 12(partially)

a first electrode, a first layer having an acceptor level in contact with the first electrode, a first layer having a donor level in contact with the first layer having the acceptor level, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a second layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the second layer having the acceptor level, and a second electrode in contact with the second layer having the donor level.

---

The application lacks unity within the meaning of Article 82 EPC for the following reasons:

According to Article 82 EPC, "The European patent application shall relate to one invention only or to a group of inventions so linked as to form a single general inventive concept".

This is further clarified in Rule 44(1) EPC, which details that "the requirement for unity of invention...shall only be fulfilled when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features...which define a contribution which each of the claimed inventions, considered as a whole makes over the prior art".

In the present application the following is claimed:

Claim 1 defines a light emitting device comprising: a first electrode, a

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

laminated body including a layer containing a light emitting substance in contact with the first electrode, a layer having an acceptor level, in contact with the laminated body, a layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

Claim 3 further defines a light emitting device comprising: a first electrode, a first layer having a donor level in contact with the first electrode, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

Claim 4 further defines a light emitting device comprising: a first electrode, a first layer having an acceptor level in contact with the first electrode, a first layer having a donor level in contact with the first layer having the acceptor level, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a second layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the second layer having the acceptor level, and a second electrode in contact with the second layer having the donor level.

To decide whether a feature common to the 3 groups of light emitting devices is a special technical feature, we must apply the teaching of Article 82 EPC, and Rule 44(1) EPC, which stipulate that the technical feature must define a contribution over the prior art (i.e. be inventive over the prior art) to be recognised as the special technical feature (which gives rise to unity).

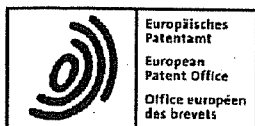
For the purposes of unity, a single general inventive concept is required. This means that the broadest possible problem to be solved has to be drawn up (i.e. to cover all claimed possibilities).

It is considered that the general problem underlying the present invention is the provision of light emitting device which will permit the use of wide range of electrode materials (see page 3, paragraph 3, of the present description).

However, the document EP1418567 A (D1) already discloses a light emitting device (see claim 1, and Figure 6) comprising: a first electrode (6), a laminated body (5) including a layer containing a light emitting substance in contact with the first electrode (6), a layer having an acceptor level (first n-p sublayer of n-p-n-p junction (2)), in contact with the laminated body (5), a layer having a donor level (second n-p sublayer of n-p-n-p junction (2)) in contact with the layer having the acceptor level, and a second electrode (1) in contact with the layer having the donor level.

Thus, the light emitting device of D1 solves the above-mentioned problem in an identical manner to the present invention (see column 12, paragraph [71]). The composition in present claim 1 cannot be regarded as the special technical feature which links together the separate inventions disclosed in the present application.

Since there are no apparent features which may be regarded as the special technical feature, which could link the different inventions of the



**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 05 78 3151

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

application, then there is a lack of unity.

In the light of the above, the examiner has identified, a posteriori, 3 different subjects:

In accordance with Rule 164(1) EPC the supplementary search report has been drawn up for those parts of the application which relate to the invention, or group of inventions, first mentioned in the claims (Subject 1).

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 78 3151

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-03-2011

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|----|---------------------|----------------------------|---------------------|
| EP 1418567                                | A1 | 12-05-2004          | CN 1499900 A               | 26-05-2004          |
|   |    |                     | FR 2846794 A1              | 07-05-2004          |
|   |    |                     | JP 2004163935 A            | 10-06-2004          |
|   |    |                     | KR 20040040362 A           | 12-05-2004          |
|   |    |                     | US 2004089870 A1           | 13-05-2004          |
| EP 1339112                                | A2 | 27-08-2003          | CN 1438828 A               | 27-08-2003          |
|   |    |                     | JP 4570014 B2              | 27-10-2010          |
|   |    |                     | JP 2004039617 A            | 05-02-2004          |
|   |    |                     | KR 20030069097 A           | 25-08-2003          |
|   |    |                     | TW 264240 B                | 11-10-2006          |
|   |    |                     | US 2003170491 A1           | 11-09-2003          |
|   |    |                     | US 2005029933 A1           | 10-02-2005          |

The examination is being carried out on the **following application documents**

**Description, Pages**

1-87 as published

**Claims, Numbers**

1-17 as published

**Drawings, Sheets**

1-22 as published

1. The application lacks unity within the meaning of Article 82 EPC for the following reasons:

According to Article 82 EPC, "The European patent application shall relate to one invention only or to a group of inventions so linked as to form a single general inventive concept".

This is further clarified in Rule 44(1) EPC, which details that "the requirement for unity of invention...shall only be fulfilled when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features...which define a contribution which each of the claimed inventions, considered as a whole makes over the prior art".

In the present application the following is claimed:

Claim 1 defines a light emitting device comprising: a first electrode, a laminated body including a layer containing a light emitting substance in contact with the first electrode, a layer having an acceptor level, in contact with the laminated body, a layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

Claim 3 further defines a light emitting device comprising: a first electrode, a first layer having a donor level in contact with the first electrode, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.



Claim 4 further defines a light emitting device comprising: a first electrode, a first layer having an acceptor level in contact with the first electrode, a first layer having a donor level in contact with the first layer having the acceptor level, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a second layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the second layer having the acceptor level, and a second electrode in contact with the second layer having the donor level.

To decide whether a feature common to the 3 groups of light emitting devices is a special technical feature, we must apply the teaching of Article 82 EPC, and Rule 44 (1) EPC, which stipulate that the technical feature must define a contribution over the prior art (i.e. be inventive over the prior art) to be recognised as the special technical feature (which gives rise to unity).

For the purposes of unity, a single general inventive concept is required. This means that the broadest possible problem to be solved has to be drawn up (i.e. to cover all claimed possibilities).

It is considered that the general problem underlying the present invention is the provision of light emitting device which will permit the use of wide range of electrode materials (see page 3, paragraph 3, of the present description).

However, the document EP1418567 A (D1) already discloses a light emitting device (see claim 1, and Figure 6) comprising: a first electrode (6), a laminated body (5) including a layer containing a light emitting substance in contact with the first electrode (6), a layer having an acceptor level (first n-p sublayer of n-p-n-p junction (2)), in contact with the laminated body (5), a layer having a donor level (second n-p sublayer of n-p-n-p junction (2)) in contact with the layer having the acceptor level, and a second electrode (1) in contact with the layer having the donor level.

Thus, the light emitting device of D1 solves the above-mentioned problem in an identical manner to the present invention (see column 12, paragraph [71]). The composition in present claim 1 cannot be regarded as the special technical feature which links together the separate inventions disclosed in the present application.

Since there are no apparent features which may be regarded as the special technical feature, which could link the different inventions of the application, then there is a lack of unity.

In the light of the above, the examiner has identified, a posteriori, 3 different subjects:

Subject 1: claims 1, 2, 6, 7, 15 (completely); and claims 12, 13 (partially): a light emitting device comprising: a first electrode, a laminated body including a layer containing a light emitting substance in contact with the first electrode, a layer having

an acceptor level, in contact with the laminated body, a layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

Subject 2: claims 3, 8, 9, 16 (completely); and claims 5, 12, 13 (partially): a light emitting device comprising: a first electrode, a first layer having a donor level in contact with the first electrode, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level. a layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the layer having the acceptor level, and a second electrode in contact with the layer having the donor level.

Subject 3: claims 4, 10, 11, 14, 17 (completely); and claims 5, 12 (partially): a first electrode, a first layer having an acceptor level in contact with the first electrode, a first layer having a donor level in contact with the first layer having the acceptor level, a laminated body including a layer containing a light emitting substance in contact with the first layer having the donor level, a second layer having an acceptor level in contact with the laminated body, a second layer having a donor level in contact with the second layer having the acceptor level, and a second electrode in contact with the second layer having the donor level.

In accordance with Rule 164(1) EPC the supplementary search report has been drawn up for those parts of the application which relate to the invention, or group of inventions, first mentioned in the claims (Subject 1).

2. The partial search report is made considering the first invention only (subject 1: claims 1, 2, 6, 7, 15 (completely); and claims 12, 13 (partially)).

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

D1 EP 1 418 567 A1 (THOMSON LICENSING INC [FR]) 12 May 2004  
(2004-05-12)

D2 EP 1 339 112 A2 (EASTMAN KODAK CO [US]) 27 August 2003  
(2003-08-27)

3. The present application does not meet the requirements of Article 52(1) EPC because the subject matter of claims 1, 6, 13 and 15 is not new within the meaning of Article 54(1) and (2) EPC.

Document D1 discloses a light emitting device (see claim 1, and Figure 6) comprising: a first electrode (6), a laminated body (5) including a layer containing a light emitting substance in contact with the first electrode (6), a layer having an acceptor level (first n-p sublayer of n-p-n-p junction (2)), in contact with the laminated body (5), a layer having a donor level (second n-p sublayer of n-p-n-p junction (2)) in contact with the layer having the acceptor level, and a second electrode (1) in contact with the layer having the donor level.

Therefore the subject matter of claims 1, 6, 13 and 15 is not novel.

4. The present application does not meet the requirements of Article 52(1) EPC because the subject matter of dependent claims 2, 7, and 12 does not involve an inventive step within the meaning of Article 56 EPC, the reasons being as follows: the features comprised in these claims are either suggested in D1/D2 or are conventional in the technical field of organic light emitting devices.

claims 2, 7: (see D2: page 19, paragraph [106]; Example 5, Alq doped with Cs);

claim 12: the features comprised in this claim are conventional in the technical field of organic light emitting devices;

#### **(5) Concluding remarks:**

It is not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable, amendments should be filed taking into account the following points:

#### **Amendments relating to the claims:**

- the set of claims should be restricted to one independent claim per category as prescribed in Rule 43(2) EPC, which can be accompanied by dependent claims in accordance with Rule 43(4).
- the application does not meet the requirements of Article 84 EPC, because claims 13-17 are not clear.

In claim 13 the light emitting device has been defined by its function instead of its structure (namely by the process of injecting holes in the case of applied bias on the device structure). This renders the claim unclear because it leaves the reader in doubt as to the kind of device structures the expression means. The objection can be overcome by inserting in claim 13 structural details of the light emitting device.

The same remark as above applies mutatis mutandis to claims 14-17.

**Amendments relating to the description:**

- the background part of the description should be revised to include a summary of the most relevant prior art in accordance with Rule 42(1)(b) with an identification of the documents on which said prior art is based, namely D1 and D2; and
- the description should be brought into conformity with the new claims.

**Furthermore, the applicant should indicate when filing amendments:**

- the difference between the subject matter of the new claim and the state of the art, and the significance thereof with regard to the inventive step involved by the claimed invention; and
- where a basis can be found for the amendment in the document as originally filed according to Guidelines E II, 1.